

A
SANITARY PRIMER
FOR

INDIAN SCHOOLS
Checked
BY
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J. M. CUNNINGHAM, M. D.,

SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA



Issued under the authority of the Government of India

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Lahore :

GOVERNMENT CENTRAL BOOK DEPOT, PUNJAB,
THE "ARYA PRESS," LAHORE.

1882.

Price—1 anna.

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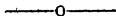
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PRINTED FOR THE GOVERNMENT CENTRAL BOOK DEPÔT, PUNJAB, BY
RAM DAS, AT THE "ARYA PRESS," LAHORE.

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A
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FOR INDIAN SCHOOLS.

INTRODUCTION.

HEALTH is one of the greatest blessings that man can have. When sick, he either cannot work at all, or work is a terrible toil, and things which give him pleasure at other times bring him little or no pleasure then. Sickness not only takes away enjoyment from life, but it often brings sad privation and want. When a man is not able to work as usual, he and his family are deprived of many comforts they could afford before, and they often fall into great distress, which continues long after he gets well again. Or the sickness may prove fatal, and death may rob the household of the worker in the prime of life whose earnings were so essential to their comfort and happiness. And what is true of one family is true of all the families which make up every town and village. But though health is such a blessing to every individual, and such a treasure to the community at large, how generally is it neglected! Few realize its value until they lose it. When a person gets ill he applies to a doctor or *hakim*, and may spend such time and money before he is well. How much better would it be if the cause of his illness had not existed. It may be a very trifling cause, the removal of which would not cost him nearly so much as he has to pay the doctor, not to speak of the money he may have lost while unable to work and of the suffering he may have endured; for the great mass of the diseases from which men suffer and die are due to man's own carelessness or neglect. Such diseases

are said to be preventable, and it is to prevent disease that sanitation, or hygiene as it is otherwise called, aims. Until recent years little was done in this direction. Every one was busy aiding in the production of disease; few attempted to prevent it. Every one may do something to prevent disease. But in order to understand what every one may do to prevent disease, it is necessary to know first what man requires to keep him in good health. In a little book like this it is impossible to discuss everything that bears on health, or even to discuss any one of these things very fully; but a few simple words about the most important of such things may be easily understood even by children. They may easily learn what are the principal laws of health; how these laws are either neglected or violated in every Indian town and village; and what can be done to remedy this state of things, and make these towns and villages more healthy than they are.

CHAPTER I.

A I R.

Importance of pure air.

IN order to live man must have air and water and food. He cannot exist for many days without water or food, but without air he dies in a few minutes. Of all the necessities of life, therefore, air is the most necessary. You cannot see the air, you cannot feel it unless when it moves against you, and then it is called wind; but at all times you are living in a great atmosphere, near the bottom of which you move just as fish move about in water. And if air be so essential for life, it is equally true

that pure air is essential for health. If an animal is shut up in a confined atmosphere, as, for instance, a mouse in a glass case, he soon begins to pant, and then he dies. The air is rarely rendered so impure as to be altogether unfit to support life, but very frequently it is so impure that those who breathe it become pale and lose health, and suffer all manner of diseases.

The chief causes which render air impure.

Great natural processes are continually going on which render the air impure. First of all *respiration* or *breathing*. By every breath which living animals draw a certain amount of air is rendered impure. A portion of the essential element of that air,—its oxygen, on which life depends,—is abstracted in the lungs, and is replaced by a noxious compound—carbonic acid gas. At the same time a large amount of watery vapour is added together with various injurious compounds formed in the body. The mouse in the closed jar dies partly because the oxygen in that air has been expended, for neither the carbonic acid nor the watery vapour can take the place of the oxygen in supporting life, and partly because of these injurious compounds. Common *combustion* or *burning* is another great agent in destroying the purity of the air. Every thing that is burnt requires oxygen, otherwise it could not burn, and the resulting product is to a large extent the same noxious carbonic acid gas which is given off in respiration. If, instead of a mouse, you place a burning body in a closed jar, it will soon be extinguished, because the oxygen is soon expended, and without oxygen combustion cannot go on. Then, again, all *putrefaction* or *decay* is a great destroyer of the purity of the atmosphere. In all matter, whether animal or vegetable, this process commences soon after death. In hot climates it commences very early, and gases are given off in large quantity, some of which are highly poisonous.

Dead bodies, whether of men or of beasts, dead plants, or portions of plants, all undergo a process of decay, and in that process give off noxious gases. Under this head also come the *excretions* of the living body—the perspiration from the skin, the evacuation from the bowels, and the urine, dead matters which are given off by all living animals, and which commence to putrefy in some cases even before they have left the body. And there are also the *exhalations* from the soil. For the soil is not a solid, impermeable mass of clay, or earth, or sand, as it seems to us. Between its surface and the level of the water underneath, air enters more or less freely, and this air mixes with the air in the atmosphere above. If, then, there is any thing in the soil to render the soil air impure, this impurity will find its way upwards, and will affect the atmosphere we breathe. Organic matters which have come from man or other animals, and which too frequently are left on the ground as if they were perfectly harmless there, all have a bad effect, and so has decaying vegetation. And these evils are increased when the soil is damp. Putrefaction is rendered more active, and the air carries with it watery vapour which causes unwholesome cold. The ground, in ordinary words, is said to be damp. It is by this damp and by decaying vegetation that the air of marshes renders a place unhealthy. The marsh may be some distance off, and the impure air may be borne along to the town or village by the wind. *Domestic operations*, such as washing and cooking, if the resulting impurities are not safely disposed of, help to defile the air. And lastly, there are *certain trades* which make the air impure. Butchers and tanners and dyers, and others who deal with dead animal or vegetable matter, all, more or less, pollute the air; and others, again, such as grinders of metal or workers in factories, in the very nature of their work, cause small particles of gritty or other matters to fly off

into the air, and these, when inhaled, are apt to cause disease.

Nature's methods of purifying the air.

The sources of impurity in the air are thus very large and numerous, and they are always going on. If Nature did nothing to counteract them, life would soon become impossible; but there are great laws which remedy the evil to a large extent. By the law of the diffusion of gases, noxious gases spread of their own accord, and are gradually mixed with the atmosphere at large. Winds cause rapid movements and interchange of air. And green living plants decompose the carbonic acid so largely generated by living animals and by the plants themselves, and send back the oxygen into the air. These three great purifying operations—the diffusion of noxious gases, the movement of the wind, and destruction of carbonic acid by green living plants—which are constantly going on, counteract in a large measure the impurities which are caused by the different processes above mentioned. But they are frequently impeded by man, who, besides causing all kinds of impurities in the air, too often shuts himself up in a house so constructed that the natural processes for neutralizing these impurities can have little or no effect, and in towns houses are crowded together so that a great many people live within a small area, and the danger of breathing impure air is thereby much increased.

Common causes of impure air in Indian towns and villages.

The evils which have been sketched above may be seen in more or less intensity in every village and town in India. The houses consist either of court-yards, with

dead walls shutting out both air and light, or of cottages in which, when the door is closed, there is no means of ventilation whatever. The inhabitants sleep crowded together in small rooms, from which the air, rendered impure by respiration, has little means of exit, and into which fresh air can with difficulty find entrance to take its place. The people thus breathe again and again some portions of air which have been already respired. To make the evil still greater, it is a common custom to sleep with the head and face closely covered by a blanket. The fires used for cooking, and the small oil lamps which are used to give light, not only take away oxygen from the air, but pour into it poisonous gases and other matters, all of which add to the impurities of the air. The dead are often buried close to the dwelling-houses, or are imperfectly burnt not far off. The carcases of animals are left to decay until devoured by birds or beasts. The rank vegetation, which not uncommonly grows close up to the doors, is allowed to rot where it falls. Personal cleanliness is not attended to as it ought to be, or after the bath dirty clothes are again put on, and the coverings under which people sleep are saturated with perspiration and other excretions from the body. The evacuations from the bowels are not properly disposed of. They may be seen on the road sides, or even in the streets. More frequently the inhabitants answer the calls of nature in the early morning among the high crops, or in any other shelter that is to be found near. Sometimes they frequent the tops of the houses, and in these situations the excreta lie until they dry and are blown about as a fine powder in the air or washed down by rain; or, if there is a latrine, it is generally saturated with filth, and drains down more or less into the neighbouring ground—it may be into the street, or the court-yard, or wherever it can. Or the latrine may

have no apparent exit, and all the filth is allowed to fall into a recess below, or into a deep pit or cesspool. Any corner is used for passing urine. The dung of animals either lies about in a neglected manner, or, if it is valued as manure it is collected in a heap to decay near the house. These arrangements either pollute the air directly, as is often plain from the disagreeable smell, or they pollute the soil and the soil air, which is just as bad. And this last process, the pollution of the soil, is further assisted by damp. People bathe in whatever place they find most convenient, and the water soaks into the earth, carrying with it the matters decomposing on the surface. The drainage often is bad. The numerous holes afford place for the rain to lodge, or it stagnates by the house and acts all the more injuriously, because the floor is not unfrequently lower than the general surface of the ground. An undrained marsh may lie not far off, the air from which, rendered impure by damp and decaying vegetation, brings with it impurities and causes the diseases which are so common in marshy places. Kitchen refuse is thrown anywhere, and sometimes also water used for washing dirty clothes; but this latter process is more commonly carried on by wells or in tanks, and it will be referred to in the following chapter. And, lastly, the butchers are allowed to slaughter cattle and deposit the offal in any way they like, and the tanners and dyers and others carry on their work in the public streets, and are a nuisance to all around them.

How these impurities in the air are to be prevented.

Now how may the impurities arising from all these sources be either counteracted or altogether prevented? Some of them cannot be prevented. Respiration and combustion, for example, must go on, and wherever they go on, the essential oxygen of the air is expended and

replaced by a gas which cannot support life. But if natural laws be not impeded, no harm results from these processes. In order to prevent the evils which arise from breathing air which has been already respired, the house must be so arranged as to allow the free access of air from outside ; in other words, the house requires *ventilation*. It is not necessary that there should be a draught, for the air in a room or in a house changes much even when no movement of air is perceptible in it. But in order to afford a sufficient quantity of fresh air without a draught, too many persons must not occupy the same house or the same room at the same time ; otherwise they will defile the air more rapidly than the fresh air from without can come in. In other words, there must be *no overcrowding*. In public institutions, such as barracks or jails, the space to be allowed to each person has been very carefully prescribed. The allowance may be determined by cubic measurement, that is, by multiplying the breadth of a room by its length and height, and so calculating the whole air-space. For example, a room $10' \times 10' \times 10'$ contains 1,000 cubic feet of air. Prisoners are allowed 648 cubic feet per head. Or it may be determined by floor or superficial space. A room $10' \times 10'$ contains 100 superficial feet of space. For native soldiers the allowance is 62 superficial feet, for prisoners it is 36 superficial feet ; but in the case of the latter it must be remembered that they sleep in lofty barracks, much more lofty than ordinary Native rooms, and with numerous barred openings, through which the air passes most freely. For all practical purposes superficial measurement will suffice. Each person ought, if possible, to have 48 superficial feet, or a space, say, eight feet long by six feet wide ; and openings should be made in the upper part of the room walls, so that the foul air of respiration, which generally rises because at most seasons of the year it is warmer than the surrounding air, may pass out. The size

of these openings should depend on the number of occupants of each room. As a rule, it may be said that if a room, after being occupied by one or more people for a time has a heavy or other disagreeable smell to a person coming into it from outside, the ventilation is insufficient.

In fixing the amount of space which ought to be allowed per head, it should be borne in mind that *sick persons* require more air than people in health. When sick, persons give off from their skin and lungs a larger quantity of impurities than when in health, and these impurities are often in an active state of putrefaction. In order to keep the air around them fit for them to breathe, a larger supply than ordinary is therefore necessary. This is important for the sick themselves, and it is also important for the healthy who may be in attendance on them.

Children require fresh air as much as grown up people, and the custom of shutting up women during childbirth in rooms from which the air is carefully excluded, and which are often crowded with neighbours and friends, is not only bad for the mother, but extremely dangerous to the newborn child. Many children die during the first few days of life, because they have not a sufficient supply of pure air to breathe.

Fires should not be burnt inside the rooms where people live, unless there is some chimney or other means by which the foul air and the smoke may be carried outside without their mixing with the air in the room, and a similar provision might easily be made for allowing the smoke and gases given off by the rude lamps used in this country to escape.

As regards the evils arising from putrefaction, the great general principle to be observed is that all dead

animal and vegetable matters should be safely disposed of, as far as possible, before putrefaction sets in. The dead should either be carefully buried or burnt in a place set apart for the purpose at some distance from habitations. If buried, the grave should, if possible, be at least four feet deep and covered over with abundance of earth. If burnt, the burning should be thorough. Dead animals should be removed without delay and buried in a spot at some distance off. Earth should be well rammed over them.

Dead vegetation should be collected with other refuse which is valuable for manure, such as the dung of lower animals, and made into a heap at least 100 yards from the dwelling. A small quantity of earth thrown over this heap from time to time will greatly assist in preventing any unpleasant smell arising from it, and will not diminish its value in agriculture.

The skin can be kept in a proper state, and the half putrid excretions which are given off from it when it is dirty can be prevented only by cleanliness. The daily use of water all over the body is essential. It may be used either cold, and for the young and vigorous, cold water is generally best; but for the old, or weak, or sickly, tepid water is more suitable. In order to perform its functions properly, the skin must be kept clean, for it has important functions to perform. The skin, although it is outside the body, is an organ just as much as any organ inside. It is furnished with innumerable pores, which have a part to perform; but they cannot perform this part properly unless the skin is kept clean. But there is not much use in keeping the skin clean if the clothes you wear or the bedding you sleep in are dirty. All these should be frequently aired, and kept scrupulously free from all impurities.

In all towns of Europe which are in a proper state sewers have been provided for carrying off the great mass of impurities caused by the population—the night-soil and urine, the water from kitchens, and the water from bathing and other cleansing operations. All these constitute what is called sewage. The closets which take the place of latrines, and the sinks or places in which refuse water of all kinds is deposited, deliver their contents into pipes; these, as they meet from different houses, communicate with larger pipes, and these again with main pipes or masonry sewers, until the whole passes away into the sea, or, what is better, to fertilize some selected piece of ground. Once such works have been constructed, the cost of keeping them in order is not great, and as the whole sewage carries itself away by gravitation, the great labour and expense of hand carriage is saved. Sometimes, where sufficient fall cannot be had, it is necessary to collect the sewage at a low point and pump it up to a higher level. This causes extra expense, and unfortunately this difficulty is one which, owing to the flatness of the country, is often met with in India. It had to be overcome in Calcutta, where a pumping engine is needed to raise the sewage sufficiently high to allow of its running of the Salt Lakes. In Calcutta the sewerage has been carried out in a modified form. Even in those parts of the town where it has been finished there are no complete house connections, as they are called, but the fœcal and other matters are deposited in the sewers by hand at certain depôts, some of them public and some private, which have been furnished for the purpose. The objections to a system of sewers in Indian towns are the original cost, which is considerable even when no pumping is required, the limited supply of water which is generally available, and the fact that hand labour is cheap. But some of these objections are by no

means insuperable. Pipes of small diameter will carry off the sewage of a large population, if sewage only is allowed to enter them. And it is to be understood that they are intended only for sewage and not for surface drainage, for which other provision should be made, as will be presently mentioned. If such pipes were made of good earthenware as may eventually be manufactured in this country, the cost will be very much less than the cost of iron pipes or masonry sewers. Then it is to be hoped that the water-supply of towns may be much improved. At present it is generally scanty, but if an ample quantity were provided, such as ought to be provided for ordinary domestic purposes, this quantity is quite sufficient for carrying all sewage along the pipes. Sewers have great advantages over hand carriage, which requires constant supervision, and which even with this supervision can never be as effectual.

For the present, however, sewers need not be further discussed. They hardly exist in India, and it must be some time before they can be adopted even in the large towns. For small towns and villages the removal of all sewage matters by hand is the only system which can be carried out, at least for a very long time to come. To be effective, no excrementitious matters should be allowed to touch the ground. They should be received into earthen vessels, and the contents of these vessels carried away and safely disposed of at least twice every day. Different plans of latrines have been devised; but in all latrines, whether public or private, this principle should be followed—no sewage should touch the ground. In this way the ground will not be polluted. By the addition of a small quantity of dry-earth after each evacuation the air also may be kept pure. Deodorants and disinfectants are not required. They are a

waste of money, and often merely conceal the neglect of cleanliness. When removed, the sewage should be placed in shallow trenches one foot broad by one foot deep. Into this trench six inches of sewage should be placed, and the remaining six inches filled with earth. The ground should then be cultivated. Without cultivation the process is incomplete. If the ground be cultivated, the sewage is decomposed and taken up as food by the crop.

Where possible, bath-room water and cook-room water should be removed in the same way and thrown on the soil where there is some crop to take it up, for both contain organic matters, which, if allowed to soak into the soil, as has been already said, render the air impure.

To prevent damp drainage is necessary, so that the rain water may run off to the nearest stream, or, at least, that it may not stagnate near dwellings. Whenever practicable, the drains should be made of concrete or other impervious material, otherwise the water, instead of running away, will to a large extent soak into the ground. Holes and hollows should also, as far as possible, be filled up.

And for the prevention of damp the floor of the house should be well raised, and never be so low as the surface of the ground. Sleeping on cots is better than sleeping on the floor; and in damp localities or other places where fever is prevalent, it is of great advantage to sleep high above the ground—in a house raised on stakes or in an upper storey. But where this is done, the space below ought not to be occupied by cattle, for they make the air impure, and their droppings also defile the soil. The frequent coating of the walls with clay-water, or “leaping” as it is called in some parts of the country, causes damp. If done occasionally, it tends to cleanliness, but in doing it

cowdung should not be added to the clay-water, for this excrementitious matter undergoes decay, and is therefore unwholesome.

The drainage of swamps and marshes is a large work which few towns and villages may be in a condition to undertake. Good drainage and cultivation are the best preventives of what is called malaria and the fever which arises from it. If they cannot be drained and cultivated, then a thick belt of trees between the marsh and the town or village may be planted with advantage, but the proper drainage and cultivation of the area ought never to be lost sight of as the only real remedy.

In addition to sewage and drainage there are certain refuse matters, such as street sweepings, which come under neither one or other of these heads. All these should be carefully collected daily and disposed of either by burning or burying, or adding them to the manure heap placed in a safe locality. They contain animal and vegetable matters in large proportion, and if not removed they will go on decaying and polluting the air.

All trades which give rise to offensive odours should be under some regulation. Slaughter-houses and butchers' shops should be kept scrupulously clean, and flies not allowed to alight on the meat. The offal should be carefully carried away and buried. Others, as dyers and tanners, should be compelled to carry on their work in some outskirt or little-frequented part of the town or village.

By attention to all these matters much may be done to keep the air pure.

CHAPTER II.

WATER.

Importance of pure water.

PURE water is the second great essential of health. Some would put it in the first place, as more important even than pure air. The measures above recommended to keep the air pure will also do much to keep the water pure, because the water absorbs many impurities from the air, and also because if filth is removed and properly disposed of, it cannot pollute either the air or the water. But there are some dangers to which water is specially exposed, and therefore it is necessary to consider them, and also the means by which they may be averted.

Sources of water-supply.

Speaking generally rain may be regarded as the ultimate source of all water-supply. As it falls, some of it is carried on the surface to rivers and streams and tanks, and the rest percolates through the soil to various depths to feed wells and springs. Rivers and streams are also largely supplied by percolation. In the mountains the rain falls in the form of snow; and as this melts in the hot weather, it furnishes water to the rivers which rise in these mountains. In a time of drought, as you know, the rivers and streams diminish in volume, and the wells and springs either run low or dry up altogether. In the rainy season, on the other hand, when rain falls in abundance, the rivers increase enormously, and the water rises both in tanks and wells. As the rain passes through the air, especially the air of cities, it carries with it a certain amount of foreign matters; and as it percolates through the soil, it may take up salts of lime or magnesia, or other salts which the rocks contain. But for all practical purposes it may be said that where man has not polluted it,

and where it is not derived from marshes and other places loaded with decaying vegetation, it is pure and fit for use. .

How sources of water-supply are commonly polluted in Indian towns and villages, and how this pollution may be prevented.

In India the common sources of water are rivers or streams, tanks and wells. Let us see how each of these sources is liable to pollution, and how this pollution may be prevented.

Rivers and streams, as already mentioned, depend for their supply partly on surface drainage and partly on percolation through the soil. Impurities, therefore, which exist either on the surface or in the soil are carried into the river and defile the water. After rain these impurities are most abundant, and a quantity of earth is also held in suspension, which is called *silt*. It is this which makes the water muddy. These rivers are too often used as places into which filth is thrown, in order that it may be got rid of. Dead bodies are thrown into them, and also the ashes of bodies which are burnt on their banks. The margin of the river or stream is often used as a latrine, and the ordure is washed into it by the rain. Again, persons bathe and draw their drinking water from the same spot. Even in a large and active river all these impurities are serious; but when, as often happens, the water-supply is drawn from a tiny stream, or from a sluggish backwater in which there is little movement, the dangers are much greater. The only remedy is to keep surface and subsoil as pure as possible, and not to allow bathing at the spot from which water for drinking is taken. The bathing and washing of clothes should be done lower down the stream. By making a small hollow in the

sand at the side of the stream to the depth of a few feet a natural filter may be formed, and the water which gradually percolates into this hollow will be found free of silt, and also to some extent free of the other impurities which the stream contains.

Tanks are liable to many of the dangers which beset rivers and streams ; but as they are stagnant, the dangers to them are very much greater. Fœcal and other matters are poured into them from the surface, or are borne into them more slowly through soil saturated with excrement. People bathe either in the tank or by the margin of the tank from which they take water for drinking. When they bathe it is a common practice in some parts of India for the women to urinate in the tanks. Often there are latrines immediately on the sides of them. It is a common sight, especially in the morning, to find in one of these tanks, with its dark-coloured fœtid contents, some persons bathing and rinsing their mouths as they bathe, others brushing their teeth and spitting into the tank, others scrubbing their cooking pots, others washing dirty clothes or grain, and others cleaning themselves after a visit to the neighbouring latrine, the drain from which is pouring its abomination into the tank. Sometimes cattle are watered and washed at the same tank, or the stalks of hemp or jute or other fibres are left to steep and rot in it. Here, again, the only remedy is cleanliness of both surface and subsoil, and the stopping of all practices which directly defile the tank. The area which supplies the tank with water should be kept scrupulously clean, and there must be no latrines and no cess-pits near. One or more tanks kept in the greatest purity should be set aside for drinking water, and all washing operations carried on in other tanks. Small wells dug near the sides of tanks will make the ground between act as a filter, and

be convenient points for drawing. Living plants do no harm to the water ; on the contrary, they do good ; but decayed portions should be carefully removed. Hemp and other such things should not be steeped in tanks anywhere near the town or village, for the process not only defiles the water but also renders the air impure. The purest water, as already stated, should be kept for drinking ; but it is a great mistake to suppose that any water, no matter how filthy, will do for washing ; on the contrary, there is good reason to believe that the use of filthy water for this purpose is most injurious to health.

Wells ought to be entirely dependent on subsoil water ; but in India, being often without parapet walls, they receive surface drainage. The water which enters them from within generally passes through a filthy subsoil into which the excrementitious matters of ages have been allowed to fall. In many old cities, owing to this process of defilement, the water is so charged with the products of organic matter that it is undrinkable. Cess-pits are a special danger in this respect, and when they exist anywhere near a well they should be carefully cleaned out and closed. Around the well, again, there is often a depression into which the spill which takes place in drawing water falls, and this being trodden by men and animals, and mixed with droppings from cattle and other filth, forms a source of danger, for it will percolate downwards and find entrance into the well underneath. Sometimes masonry troughs are built round the well-mouth for the cattle to drink from ; but they are often dirty and the masonry cracked, and through this crack impurities may fall back into the water. Again, people often bathe at the well or wash their clothes, and the impurities from both sources descend into the water, or leaves of trees and other foreign matters fall in through the open mouth, or are blown in by the wind.

In drawing water, again, there are the dangers arising from using a filthy vessel to raise the water or a filthy rope, and as it is raised, the feet of the person who draws it are often washed by the spill, and this spill falls back into the well. Wells should not be sunk in an impure soil. No surface drainage should be allowed to enter them and no percolation from around the cylinder. They should be protected from leaves and other foreign matters falling or being blown into them, and the water should be drawn so that its purity may not be endangered in the process. No bathing or washing should be allowed near wells. There should be a parapet wall and a masonry platform extending a few feet all round the mouth. There should be no hollows in the neighbourhood, nor any holes in which drainage or other water can lodge. The mouth should have a cover with perforations for ventilation, and, if possible, a pump should be fitted on it. Pumps are expensive and apt to get out of order, but there is no difficulty in using clean vessels and clean ropes for drawing water. All bathing and washing of clothes near wells should be prohibited.

Various means of purifying water have been devised. If allowed to stand for a time, any silt or other matters in suspension will be deposited. Alum and other substances are employed for the same purpose. For more complete purification various forms of filters have been devised, and are more or less highly recommended; but if water be drawn from a pure source, no filtration is needed. The great thing is to draw it pure and keep it pure.

The great difficulty, and in fact the impossibility, of obtaining pure water in sufficient quantity within many towns has led to the adoption of schemes for bringing a supply from outside. It may be derived from a river or

a reservoir in which the rainfall of a large area is collected, or from a deep well, and then it is brought in pipes and distributed over the streets and houses. Of the advantages of such modes of supply there can be no doubt; but here again there is the difficulty of expense. There are few towns in Upper India that can as yet provide funds for the purpose; but when the desire for sanitary improvements becomes more decided, such works will doubtless be undertaken. Meantime with little or no extra cost much may be done to diminish existing evils.

It must be remembered that pure water is as great a necessity of health for cattle as it is for man. Now the unfortunate cattle have often to drink from any water hole that may be most convenient, even though it may receive the drainage and sewage of the neighbourhood. Any water is considered good enough for the lower animals. No wonder that they are thin and miserable-looking, with staring coats and often suffering from worms and other diseases.

*Importance of attention to all these points by municipalities
and headmen of villages.*

All the measures above recommended require attention from every individual, and more particularly from the head of every house; but many of them cannot be properly carried out, except by some general organization for the town or village. The preservation of tanks and wells, for example, the provision of public latrines, and the cleansing of the streets, are all matters which must be regulated by authority. In towns this authority is generally the municipality—a body representing the citizens at large; and there is no more important duty devolving on every municipality than the adoption and constant supervision of measures for preserving the health of the inhabitants. In

villages or other places where there is no municipality the headman may do much towards the same end by advice and example.

CHAPTER III.

OTHER THINGS REQUIRED FOR HEALTH.

Besides pure air and pure water, there are many other things required to keep people in good health ; but they rest more with the individual himself than those which have been already mentioned. Food and clothing and sleep are essential, and then, in addition, there is exercise and the keeping of the mind in a healthy condition. But to treat these matters fully each would require a chapter to itself, and there is not room for this in such a small book. Besides, although they are all more or less important, no decided rules can be prescribed regarding them, such as have been already prescribed regarding pure air and pure water. People cannot always select the kind of *food* they desire. It may not be procurable at all, or not procurable by the means at their disposal. Nor can they always afford to get as much food as they would get if they were rich. In regard to food, then, it is sufficient to say that the stomach should never be overloaded ; that it is better to eat two moderate meals a day than to eat one large one ; that food should be well cooked, and that it should be as varied as circumstances will admit, care being taken to provide fresh vegetables as an important part of it. The choice of drinks is generally limited. Pure water is the best drink. For ordinary use alcohol is not required, and it often does much harm. Again, in regard to *clothing*

there are the same difficulties. A man must clothe himself and family according to his means. All that can be said is, that proper clothing is a most important element of health, and that money is much better spent in good clothes than on ornaments, or in many other ways. Especially in a damp climate sufficient clothing is very necessary, for a chill is very apt to cause sickness. This precaution is specially necessary during the winter months in Northern India. Cold must there be carefully avoided as far as possible, particularly during sleep. It has been said in Chapter I that it is better to sleep on a cot than on the floor, and that the practice of covering over the head with a blanket is objectionable, and this is quite true ; but if a person cannot afford sufficient clothing to keep him warm, it is better for him to sleep on the ground, and to cover his head up during sleep, than for him to suffer from the cold. *Exercise* and *sleep* cannot always be regulated according to will. Men and women, too, are often obliged to labour early and late ; but those who have the power to choose in these matters should bear in mind that a certain amount of exercise is good for the health, and that it makes sleep afterwards all the sounder and more beneficial. Just as some people require more food than others, so some require more sleep than others. For the young abundant sleep is most important. Others must be guided by experience as far as they can. The lot of most men is to labour in some way or other, and if this be performed with honest purpose, much will be done to keep the mind in a healthy state also. Mind and body are intimately bound together, and there can be no high standard of health if dissipated habits of any kind be indulged in.

All matters which either directly or indirectly affect the *offspring* are of the greatest importance, for on them depend the strength of the people in the next generation.

Early marriages, which make girls mothers before they are fully developed, are therefore to be avoided. Pure air and pure water and nourishing food are more needed by children even than by adults ; and on these matters, and their careful bringing up in other ways, it much depends whether they grow up strong and healthy or weak and sickly.

CHAPTER IV.

SMALL-POX AND CHOLERA.

THE great diseases from which the people of India suffer and die are *fevers*, with their attendant derangements of the internal organs, such as dysentery and diarrhoea and spleen, *small-pox* and *cholera*. If the sanitary improvements above recommended are carried out, all diseases will diminish ; but there are certain points connected with small-pox and cholera which deserve special notice. You are all familiar with *small-pox*. Every year some cases occur among the people near your house, and in some years the disease is very prevalent. Many persons die from it, and of those who recover many carry marks of the disease with them to the end of their lives—it may be only the disfigurement caused by pits on the face, but not unfrequently the loss of an eye or some other serious injury. In order to diminish the evils of small-pox, *inoculation* is resorted to in many parts of India, that is to say, matter is taken from a person who is ill of small-pox, and this matter is inserted under the skin of a healthy person, generally at a point near the wrist. The matter may be taken from the body of the sick person direct in its fluid form, or it may be

taken at a late stage of the disease in the form of a dry crust, and then this crust is ground into fine power and made into a paste with water or some other liquid. Experience shows that people who have the matter from a case of small-pox inserted under the skin in this way get small-pox, but, as a rule, they get it in a much milder form than if it came of itself. But this inoculation is not without danger. Occasionally, instead of a mild attack, a very severe attack is induced, and the person dies. Moreover, inoculation keeps up a loathsome disease—small-pox—and this is very objectionable.

About 80 years ago an English physician, Dr. Jenner, discovered that by taking matter from vesicles which appear on the teats and udders of cows, and which are known as *cow-pox*, and inserting this matter under the skin just in the same way as the matter from small-pox is used in inoculation, human beings may be protected from small-pox. In honour of the cow, from which this matter is obtained, he called the operation *vaccination*. At first he met with great opposition and ridicule. He was laughed at especially by his professional brethren; but he persevered, and the experience of many years now proves that what he said was perfectly true, and that he made a great discovery, which has conferred immense blessings on mankind. The matter, or lymph as it is called, is not always taken from a cow; for it has been found that when a person is successfully vaccinated the lymph taken from the arm of this person will answer just as well. Vaccination has now been adopted in all civilized countries, and in many of them every parent is obliged to have his child vaccinated within a certain period after birth. In India vaccination has not been made compulsory in any place except the city of Bombay; but in every province a special establishment is kept up by the Government,

and vaccination is offered free to all who choose to accept it. In many places much progress has been made, but in others the prejudices of the people are strongly opposed to it. They believe that there is a special goddess who watches over small-pox, and that if they attempt to interfere with her, she will bring great evils on them. And so they leave their children to die or be maimed for life by a disease which, if they would only listen to reason, they might protect them from altogether. It would be just as right to say that every disease is sent by God, and that therefore it is wrong to take medicine to cure that disease, lest God should be angry; that it is wrong, for example, to take quinine to cure fever, or in fact ever to take any medicine at all. Diseases come too often because man breaks God's laws, and, as we have already shown, defiles the pure air and pure water which God has given us. It is most important that vaccination should be extended so that every person in India may be protected from small-pox. Occasionally the disease appears even in spite of successful vaccination, but it then comes in a very mild or modified form. Rarely does any one who has been properly vaccinated die of small-pox. But in order to confer this protection, the operation must be successful. Unsuccessful or imperfect vaccination is of no use. For success certain conditions must be fulfilled,—*first*, there must be a perfect vesicle, and in order to secure this the arm must be protected from rubbing or other injury for a few days; *secondly*, the vesicle must not only be perfect but there must be at least three or four of them; *thirdly*, vaccination must be done in infancy; otherwise a child may get small-pox and die before it is vaccinated; and, *fourthly*, it is desirable that the person should be vaccinated again when he or she comes to the age of puberty. If these conditions be fulfilled, small-pox will almost altogether disappear.

No one has yet explained the cause of *choléra*. General sanitary improvements, such as have been recommended, will do much to diminish it; but an important feature of this disease which has been made very clear should be borne in mind, and that is the singular manner in which it attaches itself to particular places. It is on this principle that the rules for managing soldiers and prisoners in times of cholera are based, and the same principle may be acted on to a limited degree by other people. Whenever a case of cholera occurs in a house, the house, or at least the room in which it occurred, should be vacated for ten days. This is not because there is fear of infection (for experience has shown that it is no more dangerous to nurse a person sick of cholera than to nurse a person sick of ordinary fever), but the *place* where the person seems to have got the disease is dangerous. Causes exist there which gave him cholera, and which may give cholera to others who go to that place. Avoid, therefore, the *locality* in which cholera occurs. Avoid going to fairs or other places when cholera is about, and in time of cholera avoid all fatigue and exposure and feasting, and crowds of people, for these are all insanitary conditions, and they are then specially dangerous.

CHAPTER V.

REGISTRATION OF DEATHS.

BUT you may argue—"All that has been said seems sensible enough, but can you produce any evidence to show that if we adopt the simple measures you have recommended disease will really diminish, and that we shall suffer

less than our fathers and our grandfathers did before us?" There is abundant evidence of this kind. Before sanitary arrangements were attended to in England, the average annual mortality among the soldiers there was 17·9 per 1,000. Since then it has been reduced to 8·56; or, in other words, before the improvements nearly 18 men died annually out of every 1,000, and since then little more than eight have died. In India over a series of years the annual death-rate among British soldiers equalled 69 in every 1,000. Since sanitary affairs were attended to, it has largely diminished. During the five years 1871-75 it averaged only 17·62. Or to take the case of the prisoners, in former years overcrowded and otherwise ill-cared for as they were—for the importance of such matter was not realized—they died in very large numbers. During the nine years 1859-67 the mortality in the jails of the Bengal Presidency was 73·45; during the next nine years 1868-76 it was only 38·67, or less than one-half. Or to take special diseases: malarial fever, which is so common in India, used to be common in certain marshy districts of England. Since these districts were drained and cultivated, this fever has become almost altogether unknown. In England and other European countries, before vaccination became general, small-pox was as terrible a scourge as it now is in those parts of India where it is not yet accepted. Many thousands of people died of it annually. In bodies of men who are under control, and can therefore be subjected to careful vaccination, the deaths from small-pox are reduced to a very small figure. Under sanitary arrangements even cholera diminishes along with other diseases. In the jails of Bengal, which have been already mentioned, the deaths from cholera during the first nine-year period equalled 10·77 per 1,000; in the last nine-year period they equalled only 3·28, or about one-third. Cholera is generally fatal to one out of every two attacked. Of other diseases

which are less fatal than cholera, every death represents very many cases of sickness. Among the general public, cases of sickness cannot be registered, but deaths can be registered, and ought to be very carefully registered, because they show where disease is prevalent; and where disease is prevalent, causes of disease exist, which ought to be found out and remedied. In the same way the registration of births is important as an index of the well-being of the people. When the births fall below the proper proportion, this is a sign that the people are not prospering. In directing the registration of both births and deaths the Government has no object except to make the people realize their condition. All births and deaths should be carefully watched. The Government can never cleanse the villages and towns of India. The people must be awakened to the fact that much of the sickness and mortality from which they now suffer may be prevented by simple means such as have been suggested in this little book.